BEM Controls, WiseBldg Field Validation

EMIS Project Team

Jessica Granderson, Guanjing Lin, Armando Casillas

Lawrence Berkeley National Laboratory

DOE Field Validation

- Addresses the lack of objective performance and cost data that inhibit some technologies from finding their customer base.

- DOE helps to identify, install and monitor technology performance in real world installations and then communicates the results to the public via a case study

Demonstration Objectives

Validate the potential of Selected technology

Technical Examples

- Verify energy reduction, associated utility cost savings, peak demand reductions
- Verify occupant satisfaction impacts

Market Adoption

- Investigate applicability to different building types, sizes and end use systems
- Evaluate maintenance, operability benefits to operations/management staff
- Verify the cost-effectiveness

Host Site Role vs Lab Role

- **Site Role**: Work with Lab team and BEM Controls to provide information needed for site evaluation, conduct demonstration, provide information for M&V scope development and during M&V process

- **Lab Role**: Evaluate candidate sites, recruit and select site, develop M&V Scope, conduct rigorous M&V

Field Validation Schedule

- Site selection (1-3 months)
  - Interested sites fill out site recruitment and scoping forms
  - LBL follows up for any additional information

- Technology installation (1-2 months)

- Testing and evaluation (12-18 months)

- Prior examples can be found in the report for Building IQ Technology Field Validation
  (available at https://eta.lbl.gov/publications/buildingiq-technology-field)

Benefits of Participation

- Engage in low-risk pilot with installation and deployment managed by others

- Receive independent M&V and an evaluation of benefits, conducted by Lawrence Berkley National Laboratory.

- Inclusion in a well-supported, high-visibility DOE-funded demonstration program

- Gain insights regarding this technology's fit for your portfolio

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WiseBldg Overview

A **central, multi-end use building system** for small and medium commercial buildings:

- **Single-point** access across many zones, devices including thermostats, lighting, smart plugs
- **Customized dashboard** and user-friendly control interfaces
- **Optimization**, visibility into building schedules and setpoints
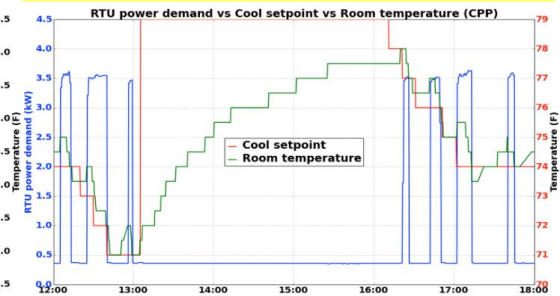- **Demand response**
- **Energy and operational cost savings**
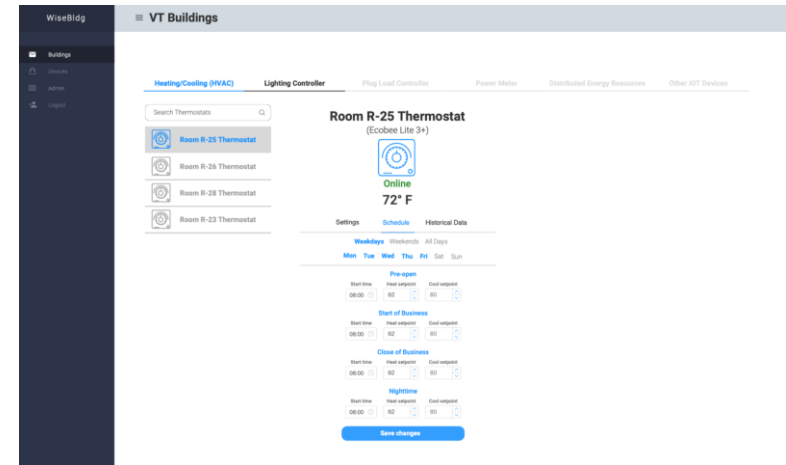
Temperature profile BEFORE WiseBldg Demand Reduction

Temperature profile AFTER WiseBldg Demand Reduction
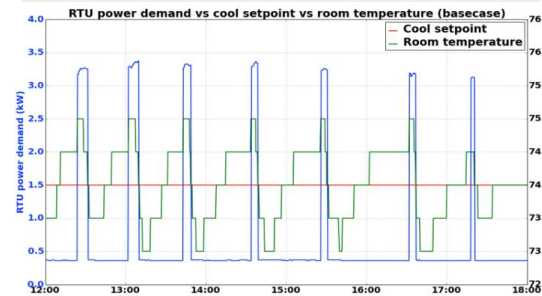
Base case (without WiseBldg)
- **Setpoint:** 74
- **Energy usage** = 2.72kWh
- **Max power demand** = 3.98kW

Managed by WiseBldg
- **Setpoint:** 79
- **Energy usage** = 1.42kWh
- **Max power demand** = 0.5kW

Image Source: https://www.bemcontrols.com/case-studies.

WiseBldg Compatible Hardware

- Compatible off-the-shelf hardware and costs

  - **Wi-Fi Thermostats (~$70 - $200):** Ecobee, ICM, Honeywell, Google Nest

  - **IR controllers for split AC systems (~$100**): Sensibo, Flair

  - **Lighting controllers (~$10 - $150):** Belkin Wemo, Wattstopper, GE, Z-Wave, Particle I/O

  - **Power meters (~$500 - $800)**: eGauge

  - **PV inverters (~$1500 - $3000):** Fronius, Sunny Boy

Software demo will be in the end of this presentation

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WiseBldg Expected Benefits

- At least 5% whole building energy savings compared to non-controlled building delivered through smart control customized for building needs

- Improved occupant satisfaction and comfort

- Annual savings on utility volumetric and demand costs

- Ability to integrate multiple pieces of hardware into one interface (thermostats, lighting)

WiseBldg Sample Estimated Installation and Running Costs (50,000 sq. foot building)

Estimated costs are for WiseBldg software only, NOT hardware. Actual costs vary depending on number and type of devices and building conditions.
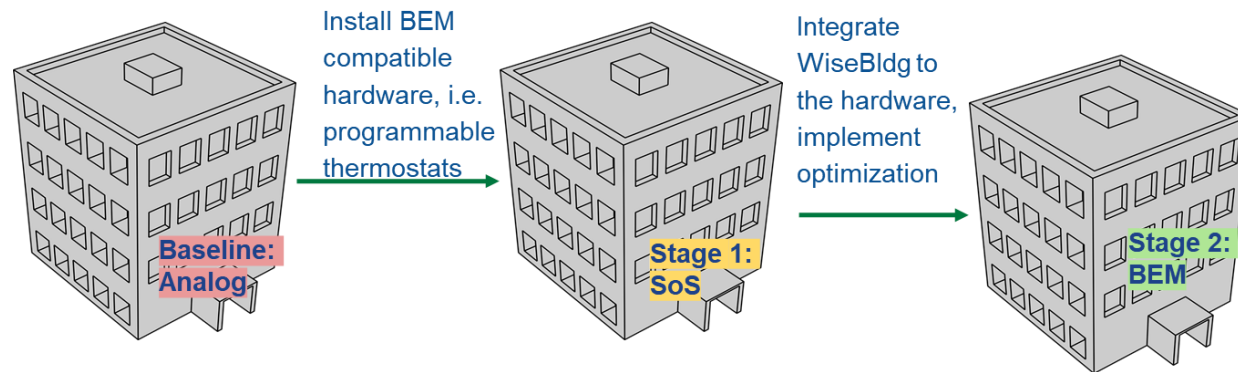
One-time costs

- Installation and Commissioning (includes device discovery, initial customized

  configuration and data analytics from power meter): **$1,500**

Annual recurring software and analytics costs

- Software control (includes web and mobile access for all smart devices through a single interface, optimized scheduling, demand response): **$3,500 per year**

- Data analytics (BEM Controls will provide full cloud access to their data): BEM Controls will provide analytics and reporting for all sensors controlled by WiseBldg and make all data available to the end customer: **$1,000 per year**
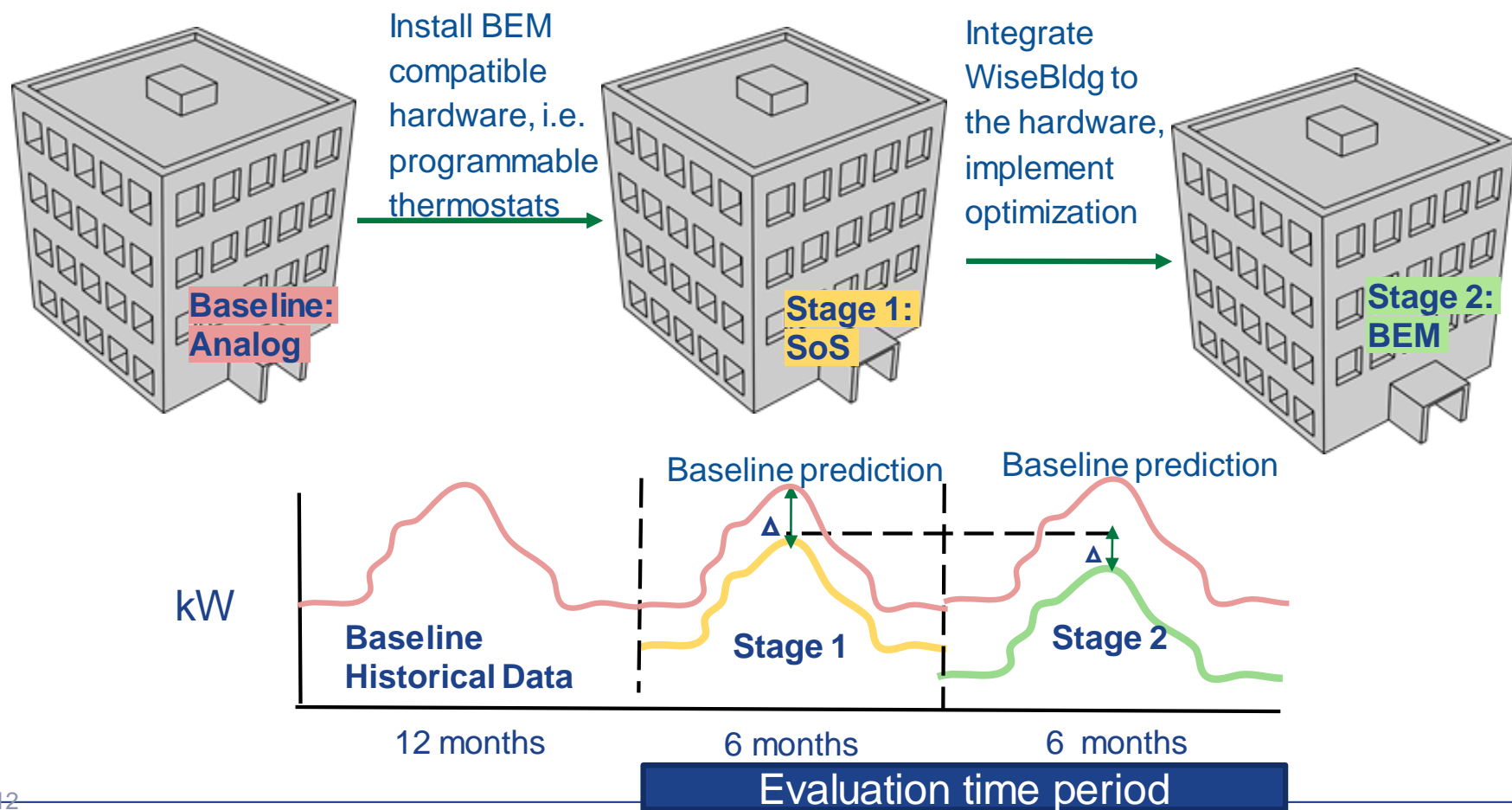
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Process of BEM Controls' WiseBldg Evaluation

Evaluate impact with WiseBldg over analog control and over SoS

Install BEM compatible hardware, i.e. programmable thermostats

Integrate WiseBldg to the hardware, implement optimization

Baseline: Analog

Stage 1: SoS

Stage 2: BEM

- Baseline, data collection

- Install BEM compatible hardware, building staff sets the installed hardware

- Evaluation Stage 1, data collection (6~9 months)

- Integrate WiseBldg software, training building staff to use WiseBldg, apply optimized setting

- Evaluation Stage 2, data collection (6~9 months)

- Data analysis and final report

Assessment of incremental value WiseBldg provides compared to SoS, as well as value over more 'naive' base case

Install BEM compatible hardware, i.e. programmable thermostats

Integrate WiseBldg to the hardware, implement optimization

Baseline: Analog

Stage 1: SoS

Stage 2: BEM

Baseline prediction

Baseline prediction

kW

Δ

Δ

Baseline Historical Data

Stage 1

Stage 2

12 months

6 months

6 months

Evaluation time period

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Site Requirements

- **Required characteristics**
  - Strip mall, school, hotel or office building, small to medium (<100,000 sq.ft.)
  - RTU less than 10 years old and able to communicate with a new Wi-Fi thermostat. Current thermostat is manually controlled.
  - Ability to upgrade to BEM-compatible thermostats and lighting controls.
  - Access to stable Wi-Fi network or allow to set the Wi-Fi network
  - Nice to have, or ability to install, smart meters to collect data at 1-hour intervals for additional analytics and sub-metering.
  - Whole building gas use, electric use, and peak demand. Interval whole building electricity usage and gas data (hourly or sub-hourly)
  - Historical baseline electrical (interval) and gas (monthly) data for 12 months

- **Other Considerations**
  - LBNL is available to work with agencies to review portfolio building characteristics and equipment to find the right sites.
  - Site will need to work with BEM Controls to clear cyber-security requirements.
  - Stable occupancy, operations, and internal loads
  - Building staff engagement, Meter ability for rigorous M&V
  - Full documentation of as-built drawings, and control systems

Host Site Owner/Operator Responsibilities

- Purchase + Install + Set BEM compatible hardware
  - Off the shelf, open API devices

- Install BEM software after 6-month period
  - Who is using platform?
  - Feedback on configuration of dashboards and mobile apps

- Participate in 1 year-long study
  - Bldg operator/user must remain engaged and properly operate recommended BEM control sequences and interface

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Next Steps

- If you are interested in hosting the technology validation in your facilities, please contact the LBNL team

Jessica Granderson	Guanjing Lin	Armando Casillas
JGranderson@lbl.gov	GJLin@lbl.gov	ACasillas@lbl.gov
510.486.6792	510.486.5979	510.486.4740

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Thank You!